

1) (4 points) Find the equation of a circle in standard form where the points $(-8, 2)$ and $(-3, 6)$ are endpoints of a diameter of the circle:

$$\text{Center} = \left(\frac{-8 + (-3)}{2}, \frac{2 + 6}{2} \right) = \left(-\frac{11}{2}, 4 \right)$$

$$\text{radius} = \frac{d}{2} = \frac{\sqrt{(-8 - (-3))^2 + (2 - 6)^2}}{2} = \frac{\sqrt{25 + 16}}{2} = \frac{\sqrt{41}}{2}$$

$$\left(x + \frac{11}{2} \right)^2 + (y - 4)^2 = \left(\frac{\sqrt{41}}{2} \right)^2 = \frac{41}{4}$$

2) (4 points each) Find the domain of the following functions:

a) $f(x) = 3x^3 + 8x - 10$

\mathbb{R}

b) $g(x) = \frac{5x^2 + 8x + 4}{x^2 + 6x + 5}$

$$x^2 + 6x + 5 = 0$$

$$(x + 5)(x + 1) = 0$$

$$x \neq -5, -1$$

c) $h(x) = \frac{4x + 1}{\sqrt{5x - 7}}$

$$5x - 7 > 0$$

$$x > 7/5$$

$$(7/5, \infty)$$

3) (5 points) The number of copies, G in thousands, sold of the game *Stardew Valley Crossing* can be modeled by the function $G(x) = -2.4x^2 + 86x + 190$ where x is the number of days after the games released. Find and interpret the average rate of change from the 5th to the 10th day after the game was released.

$$\frac{G(10) - G(5)}{10 - 5} = \frac{810 - 560}{5} = 50$$

The number of copies increased by 50,000 copies per day from Day 5 to 10.

4) (3 points each) The number of views of the viral video *Stressed Parents Secretly Hide Baby's First Drum Kit* is shown in the chart below.

Month	July 2022	August 2022	September 2022	October 2022	November 2022	December 2022
Number of Views (in millions)	1.3	2.4	3.3	3.7	4.2	6.3

Let x represent the number of months since July 2022 and let y represent the number of views in millions.

a) Using the LinReg function on your calculator, find the equation of the regression line. Round values to two decimal places:

$$y = 0.88x + 1.33$$

b) Interpret the slope and y -intercept using the language of the problem. In your interpretation, you can round values to the nearest whole number and use the word "about".

words go here

c) Assuming this trend continues, predict the number of views in April, 2023:

$$y = 0.88(9) + 1.33 = 9.25 \text{ million views}$$

$$x = 10$$

5) (2 points each) For the given graph, find the following. Write parts a – d in interval notation. For parts e and f, write in terms of x. For parts e and f, write answer as an ordered pair.

a) The Domain

$$\mathbb{R}$$

b) The Range

$$[0, \infty)$$

c) Increases

$$(1, 3) \cup (5, \infty)$$

d) Decreases

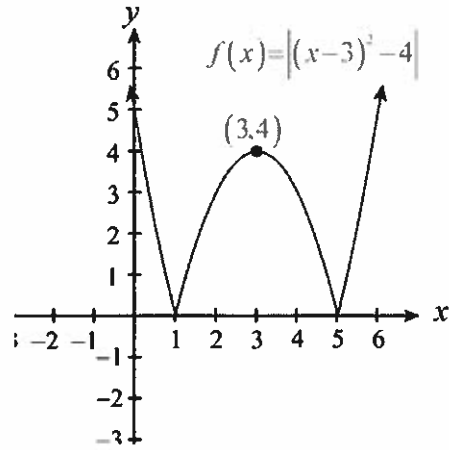
$$(-\infty, 1) \cup (3, 5)$$

e) Relative Maximum(s)

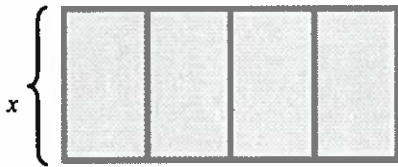
$$(3, 4)$$

f) Relative Minimum(s)

$$(1, 0) \quad (5, 0)$$



6) (4 points) Inspired by the game *Stardew Valley Crossing*, Mike decides to take up farming. He plans to build 4 adjacent, rectangular pens enclosed on all sides. He has 300 feet of fencing available. Determine a function that will relate the area of the enclosure to the width.



$$5x + 2y = 300 \quad \text{Perimeter}$$

$$\Rightarrow y = 150 - \frac{5}{2}x$$

$$\text{Area} = A = xy = x(150 - \frac{5}{2}x) = 150x - \frac{5}{2}x^2$$

7) (6 points) For the function $f(x) = 2x^2 + 5x + 1$, find and simplify $\frac{f(x+h) - f(x)}{h}$.

$$= \frac{2(x+h)^2 + 5(x+h) + 1 - (2x^2 + 5x + 1)}{h} = \frac{2x^2 + 4xh + 2h^2 + 5x + 5h + 1 - 2x^2 - 5x - 1}{h}$$

$$= \frac{4xh + 2h^2 + 5h}{h} = \frac{h(4x + 2h + 5)}{h} = 4x + 2h + 5$$

8) (3 points each) For the functions $f(x) = x^2 + 2x$ and $g(x) = \sqrt{5x - 1}$, find and simplify...

a) $(f - g)(x)$

$$= x^2 + 2x - \sqrt{5x - 1}$$

b) $(f \circ g)(x)$

$$= (\sqrt{5x - 1})^2 + 2(\sqrt{5x - 1})$$

$$= 5x - 1 + 2\sqrt{5x - 1}$$

c) The domain of $f \circ g$

$$D_g: 5x - 1 \geq 0$$

$$x \geq \frac{1}{5}$$

$$D_f: \mathbb{R}$$

$$D_{f \circ g}: x \geq \frac{1}{5}$$

9) (3 points) Find two non-identity functions f and g such that $H = f \circ g$ where $H(x) = \frac{2}{4x-1} + 5$.

multiple answers

$$f(x) = \frac{2}{x} + 5$$

$$g(x) = 4x - 1$$

10) (3 points) Determine if the function $f(x) = \frac{5x}{4x^2+12}$ is even, odd, or neither algebraically.

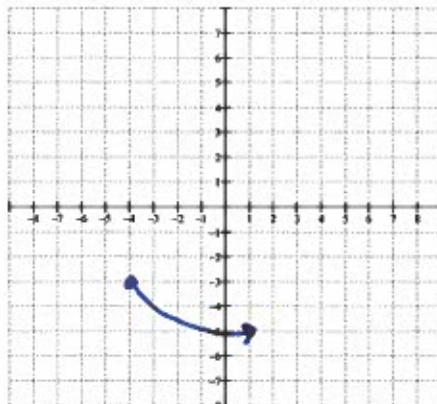
$$\underline{f(-x)} = \frac{5(-x)}{4(-x)^2+12} = \frac{-5x}{4x^2+12} = -1 \cdot \frac{5x}{4x^2+12} = -1 \cdot \underline{f(x)}$$

Odd

11) (4 points each) For the function $f(x) = -\sqrt{x+4} - 3$...

- a) Explain, in order, the transformations needed to sketch the graph: b) Sketch the graph without a calculator:

1. Left 4
2. Vertical reflect.
3. Down 3



12) (2 points each) Given the point $(3, -4)$ on the graph of $y = f(x)$, find the **exact value** of the coordinates of the point under the transformation below:

- a) $y = f(x + 6)$ b) $y = f(x) - 4$ c) $y = -f(x) - 2$ d) $y = 2f(x + 1) - 1$

$(-3, -4)$ $(3, -8)$ $(3, 2)$ $(2, -9)$

13) (1 point each) Match the following functions the best picture:

C Cube root

E Linear

D Identity

G Square

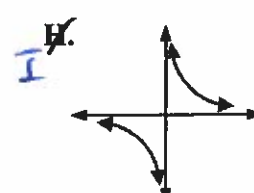
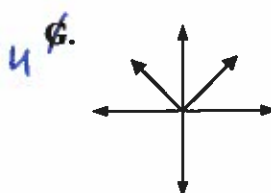
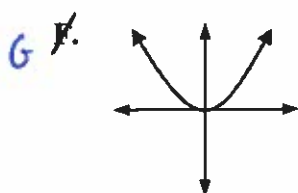
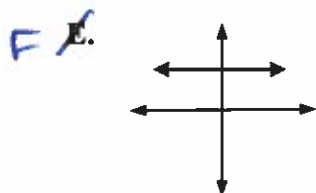
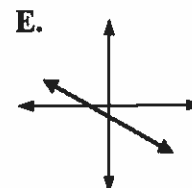
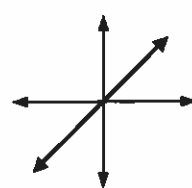
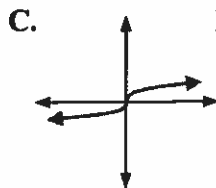
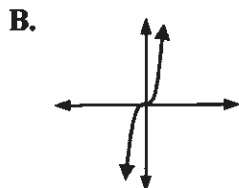
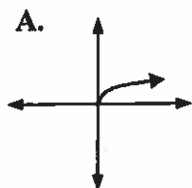
F Constant

A Square root

I Reciprocal

B Cube

U Absolute value



14) (2 points each) Short answer:

a) What makes a relation a function?

words

b) Explain why the Vertical Line Test determines if a graph is that of a function.

mean word

c) Fill in the blank: The change of the y -values per the change of the x -value of a linear function is

called the *dr. quadrat*.

d) Fill in the blank: The slope of the secant line between two points of a non-linear function is called

the *dr. biggen*